

MISSOURI Forest Health Update

December 2011



Technical updates from the Forest Health Program of the Missouri Department of Conservation

Forest Entomologist's Notes

Emerald Ash Borer (EAB) Surveys

The results of annual trapping surveys for the emerald ash borer are in. No infestations were detected in Missouri outside of the known infested area in Wayne County. However, next door in Illinois, two EAB populations were discovered for the first time in the southern part of the state, one just 70 miles east of St. Louis in Marion County and another in Effingham County.

Although no additional EAB infestations were detected this year in Missouri, the Illinois finds are good reminders that undetected infestations could be present at other locations within the state. Be alert for evidence of infestations and visit this web site to learn more and report suspect infestations: <http://eab.missouri.edu>



Emerald ash borer adult
(Photo: Forestry Images, David Cappaert)

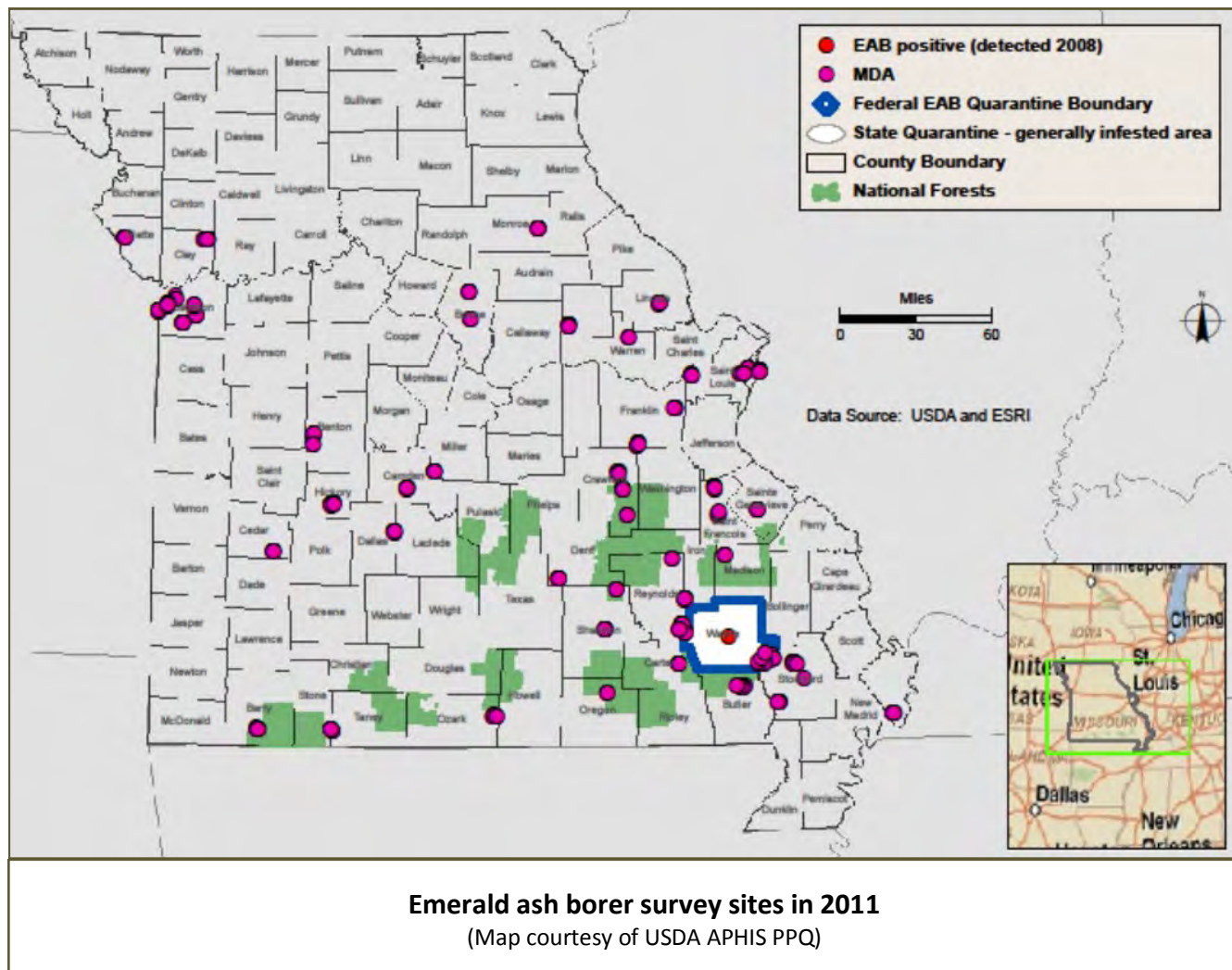
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Delimiting surveys of the Wayne County, Missouri infestation using EAB sticky traps have been conducted annually by U.S. Department of Agriculture (APHIS-PPQ) crews since 2009. In 2011, a total of 931 traps were monitored within a 10-mile x 8-mile area. Eight EAB adults were found on a total of 7 traps. The northernmost find within the delimit area this year was approximately four miles south of Iron County. The southernmost find was approximately six miles north of Butler County. The surveys focus on lowland and riparian areas where ash is more abundant.

The Missouri Department of Agriculture led a statewide survey again this year to detect other EAB populations outside of Wayne County. A total of 446 traps were monitored at 53 high-risk sites, such as campgrounds, in 31 counties. No new EAB populations were discovered.

In Illinois, the Marion County infestation was detected with an EAB trap in a rural residential area north of the town of Salem. The second infestation was detected when Illinois Dept. of Agriculture (IDA) staff traveling to Salem stopped at the Green Creek rest area on I-57 (Effingham County) to examine declining ash trees.



Following those detections, IDA expanded the interior state EAB quarantine in northeastern Illinois southward to include those two additional counties. (<http://www.agr.state.il.us/eab/>) The entire state of Illinois also remains under a federal EAB quarantine prohibiting interstate movement of untreated hardwood firewood, ash trees and logs, and other regulated articles.

EAB Management in Wayne County

The center of the Wayne County infestation is located at the Greenville Recreation Area on land owned and managed by the US Army Corps of Engineers (USACE). The USACE has worked diligently in cooperation with the Missouri Dept. of Agriculture and US Dept. of Agriculture in efforts to slow the spread of the EAB population. During 2008-2011, ash trees (greater than 4-inch dbh) were cut and destroyed on 1,400 acres around the infestation center. Destruction of larger ash trees removes a large portion of the EAB population and reduces the ash phloem resource available for EAB reproduction. Smaller diameter material was burned on

site and larger merchantable wood went to EAB compliance mills (facilities operating under strict state and federal protocols to limit spread of EAB).

The Missouri Dept. of Agriculture has led other efforts since 2009 to monitor and slow the spread of the EAB population in Wayne County. Ash trees in areas surrounding the infestation center have been stem-girdled in spring (initiating stress) and felled, debarked, and examined in the following fall and winter to serve as detection trees for monitoring EAB populations. Clusters of other ash trees treated in the same manner have been used as EAB sinks to trap and reduce EAB numbers. In 2011, another lethal trap tree technique was added. Twelve large trees (>10-inch dbh) and seven smaller ones (<10-inch dbh) remaining at the infestation center were injected with TreeAge, a systemic insecticide (emamectin benzoate) that kills larvae that begin developing within the trees. Monitoring efforts with sticky traps and detection trees continue to indicate a low-level population is present near the infestation center.

Gypsy Moth

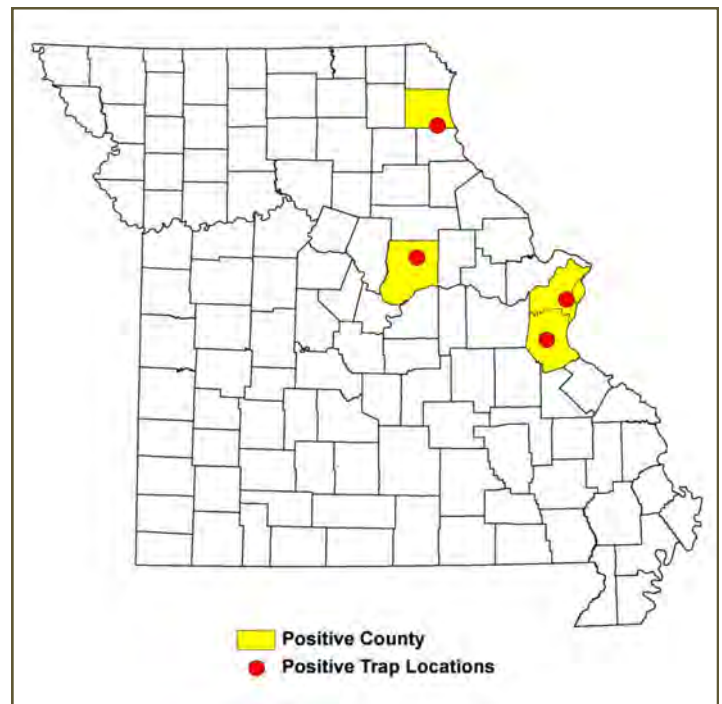
Only four gypsy moths were captured statewide in 2011 in Missouri's annual detection survey, one each in Lewis, Callaway, St. Louis and Jefferson Counties. The cooperative effort of state and federal agencies placed and monitored 6,024 traps in 60 of 114 counties. Two delimit areas of more intensive trapping were established in Jasper and Jefferson Counties around sites where gypsy moths were captured in 2010. No moths were captured this year in delimit areas. No reproducing populations of gypsy moths have yet been detected in Missouri.

<http://mda.mo.gov/plants/pests/gypsymoth.php>

However, gypsy moth populations are increasing elsewhere, and this defoliator remains a serious

threat to Missouri forests. A huge increase in gypsy moth trap catches occurred in 2010 in northeastern Iowa as far south as Jackson County south of Dubuque (near the Illinois-Wisconsin border). The first large scale, aerial gypsy moth treatments in Iowa took place this past summer using mating disruption treatments within four treatment blocks totaling over 158,000 acres. With that technique, the gypsy moth pheromone is broadcast across forests within either tiny flakes (Disrupt II) or a cream (SPLAT). The widespread presence of the sex attractant prevents male gypsy moths from identifying individual pheromone trails emitted by females, and thus effectively disrupts mating. In the 2011 trapping survey, a significant number of gypsy moths were again caught in northeastern Iowa, and a few were caught as far south as the Quad Cities (Scott County) and around Des Moines.

<http://www.extension.iastate.edu/pme/GypsyMoth.html>



**Positive gypsy moth trap locations in 2011
(one gypsy moth per positive trap)**

Meanwhile in other nearby infested states gypsy moth populations have greatly declined. Populations collapsed in Wisconsin and Indiana, with Indiana reporting that the moth capture line at the infestation front actually receded this year. In Illinois, gypsy moths are broadly established in the northern part of the state, but trap catches in 2011 were about half of those in 2010, and no gypsy moths were captured in the southern half of the state.

Asian Longhorned Beetle

No Asian longhorned beetle (ALB) infestations have been discovered yet in Missouri, but the infestation discovered this summer in Bethel, Ohio (30 miles southeast of Cincinnati) is a good reminder that ALB populations could be simmering nearby, and we need to be alert to detect them. The Ohio infestation was identified after a landowner noticed unusual damage to several maples. A survey is underway to delimit that population, and so far over 5,000 infested trees have been found.

http://www.na.fs.fed.us/pubs/palerts/alb/alb_pa.pdf

<http://www.uvm.edu/albeetle/>

<http://www.beetlebusters.info/>

The history of the ALB in North America indicates that infestations can be eradicated, if they are detected early and aggressively treated. Eradication is accomplished with visual monitoring, destruction of infested trees, and insecticide treatments (soil or trunk injections) on asymptomatic host trees within one-eighth mile of infested trees. Two success stories:

- The Chicago, IL infestation (detected in 1998; 1551 infested trees) was declared eradicated in 2008.

- Eradication is also very likely for the Middlesex/Union Counties, NJ infestation (detected in 2004; only 729 infested trees) where the last detection was in 2006.

Other infestations are much larger and have a more difficult road to eradication:

- Worcester, MA - Detected in 2008. Over 19,000 infested trees have been found and 90,000 trees have been treated with imidacloprid. The quarantine area covers 98 square miles.
- New York City and Long Island, NY – Detected in 1996. Multiple infested areas with a quarantine area of 135 square miles. Over 6200 infested trees destroyed and over 550,000 trees insecticide-treated. One isolated infestation (in the town of Islip) declared eradicated in 2011.

Suspected infestations of Asian longhorned beetles or any invasive forest pest can be reported by going to the reporting page on the Missouri EAB web site (<http://eab.missouri.edu>) or by sending an email to forest.health@mdc.mo.gov.



Asian longhorned beetle adult and round exit hole in bark
(Photo: Forestry Images, Kenneth Law)

Flooding

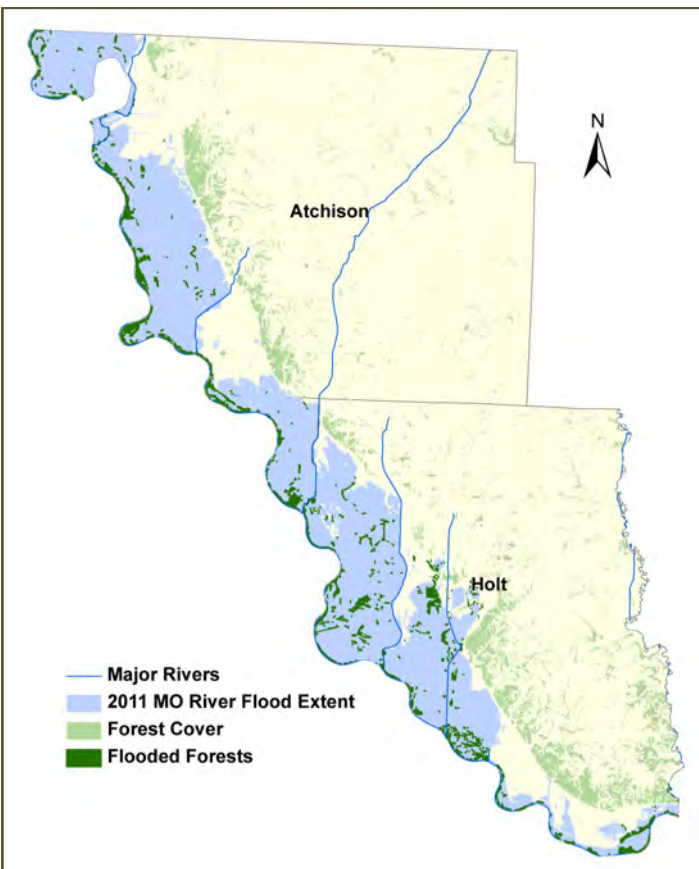
Flooding occurred in many areas of Missouri in 2011. Although some impacts on forest health were visible this summer, the full impacts and the level of tree mortality won't be apparent for another 1 to 4 years as flood-stressed trees continue to succumb to various biotic and abiotic damage agents.

Above average amounts of snowmelt and spring rains along the upper Missouri River resulted in major flooding downriver in Missouri. Conditions were most severe, lasting throughout the summer, from the Iowa state line downriver to parts of Buchanan County south of St. Joseph. Impacts were particular-

ly severe in Atchison and Holt Counties in the northwest corner of the state. Early fall leaf color and leaf drop were present by late August on larger trees in flooded areas. Many smaller trees were totally brown. Moderate flooding also occurred farther downriver from Kansas City to Jefferson City.

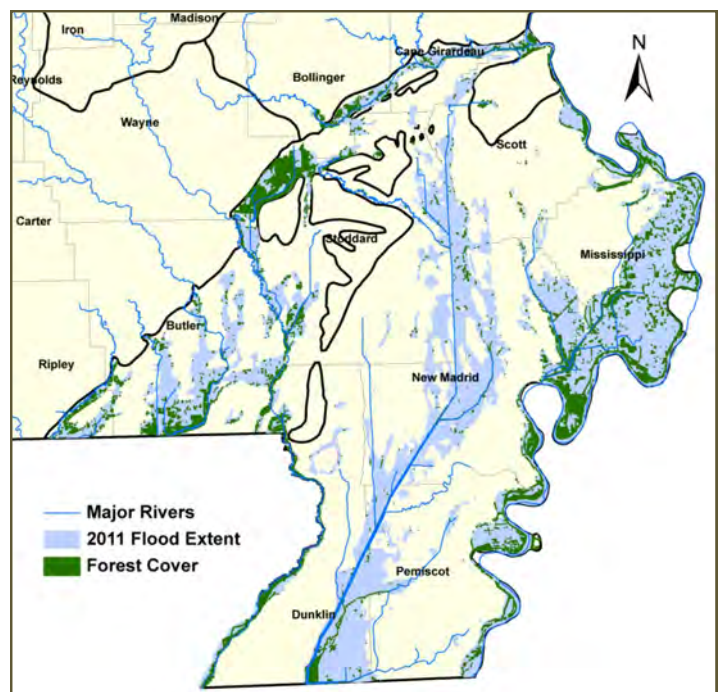
Flooding occurred along many rivers and streams in southeastern Missouri in the spring due to heavy rainfall. About 130,000 acres of primarily farmland in Mississippi County (Birds Point-New Madrid Floodway) were intentionally flooded by the US Army Corps of Engineers by breaching a levee to protect flood-threatened Cairo, Illinois.

Flooding impacts on forests are expected to be more severe in northwestern Missouri than in southeastern Missouri, because of the much longer duration of flooding in the northwest, lasting from June through September.



Northwest Missouri forests affected by Missouri River flooding in summer, 2011

(Maximum flood extent data courtesy of State Emergency Management Agency and National Geospatial-Intelligence Agency)



Southeast Missouri forests affected by flooding in spring, 2011

(Data courtesy of Frank Nelson and Dartmouth Flood Observatory)

For more information on flooding effects on trees:

<http://www.extension.iastate.edu/publications/SUL1.pdf>

http://www.na.fs.fed.us/spfo/pubs/n_resource/flood/table.htm

Forest Pathologist's Notes

Thousand Cankers Disease

Thousand cankers disease (TCD) still has not been detected in Missouri, however black walnut is ecologically and economically important to Missouri, and TCD represents a serious threat to this resource. TCD could spread on infected walnut materials from western states or Pennsylvania, Tennessee and Virginia where it has been detected. For more information about TCD, see the Missouri TCD website at www.mdc.mo.gov/thousand-cankers and the new national TCD website at:

<http://www.thousandcankers.com/home.php>

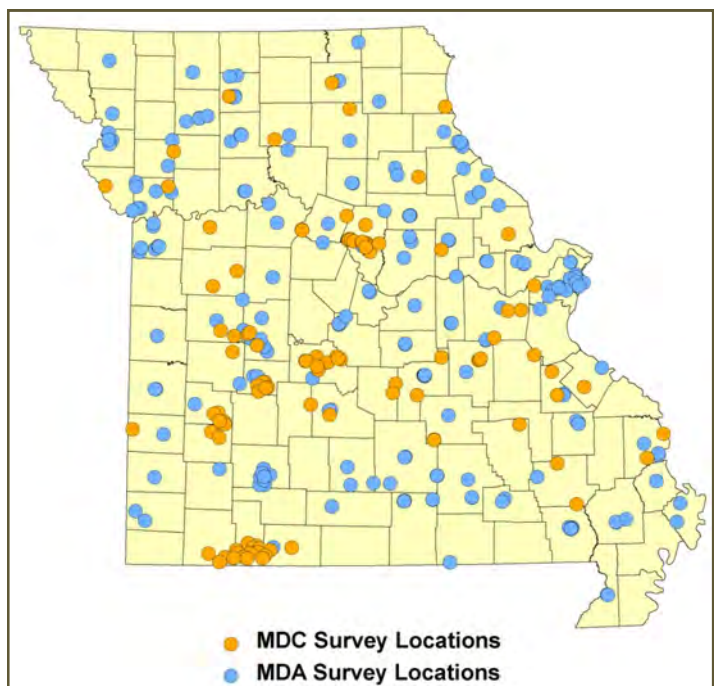
A visual survey for TCD was conducted in 2011 by the Missouri Dept. of Conservation (MDC) with USDA Forest Service funding. MDC staff examined black walnut trees at public and private campgrounds in high-risk areas and all state park campgrounds. Sixty two public campgrounds, 18 private campgrounds and 20 additional suspect locations reported by MDC staff and the public were surveyed. Additional survey work was completed by Missouri Department of Agriculture (MDA) with USDA APHIS - Plant Protection and Quarantine funding. MDA staff examined trees near walnut wood processors and 89 municipalities for a total of 215 sites.

During visual survey activities, trees observed with possible symptoms of TCD (dieback in the upper canopy, branches with attached wilted brown

leaves, and extensive epicormic sprouting) were evaluated by collecting symptomatic branches 1-2 inches in diameter. Branches were initially examined in the field. Bark was scraped away to look for any evidence of walnut twig beetle and discoloration in the tissue under the bark (phloem). When suspicious symptoms were observed under the bark, samples were transported in a secure manner to prevent spread of the disease and taken to diagnostic labs for further testing.

Although TCD was not detected, other problems detected include exposed, elongate *Fusarium* cankers on walnut trunks, defoliation from anthracnose and walnut caterpillar, and site-related decline issues. Lab testing of samples revealed infestation by several other wood-boring insects (primarily roundheaded and flatheaded borer larvae), and various fungi were cultured from discolored phloem tissue. Survey work will continue next year.

It is important to continue to look for TCD. It may be several years after introduction before symptoms of



Thousand cankers disease survey locations in 2011

the disease become obvious. Evaluate walnut trees any time they are harvested or removed, and report any suspicious trees.

See www.mdc.mo.gov/thousand-cankers, email photos to forest.health@mdc.mo.gov or contact your local Missouri Department of Conservation forester for more information on what to look for and reporting suspicious trees.

Dogwood Anthracnose

Dogwood anthracnose, *Discula destructiva*, can be lethal to flowering dogwood. Lesions develop on the leaves and girdling cankers develop on the twigs, branches and trunk. Dogwood anthracnose is not common in Missouri and has not been reported in native forested areas. It has been detected in nurseries and landscaped trees, and when traceable, has been traced to out-of-state sources. Previous known infections are believed to have been eradicated. In 2011, the Missouri Department of Agriculture confirmed the presence of *Discula destructiva* associated with flowering dogwood in three adjacent yards in the city of Kirkwood in St Louis County. All positive trees were removed and destroyed. Additional survey work will occur in Kirkwood in spring 2012. After comparing dogwood symptoms to other dogwood issues, including leaf scorch and spot anthracnose, if you think you have found dogwood anthracnose, please contact your local MDC forester or

email photos to:

forest.health@mdc.mo.gov.

For more information on dogwood anthracnose see:

http://www.na.fs.fed.us/spfo/pubs/howtos/ht_dogwd/ht_dog.htm

http://www.ca.uky.edu/agcollege/plantpathology/ext_files/PPFShtml/PPFS-OR-W-6.pdf

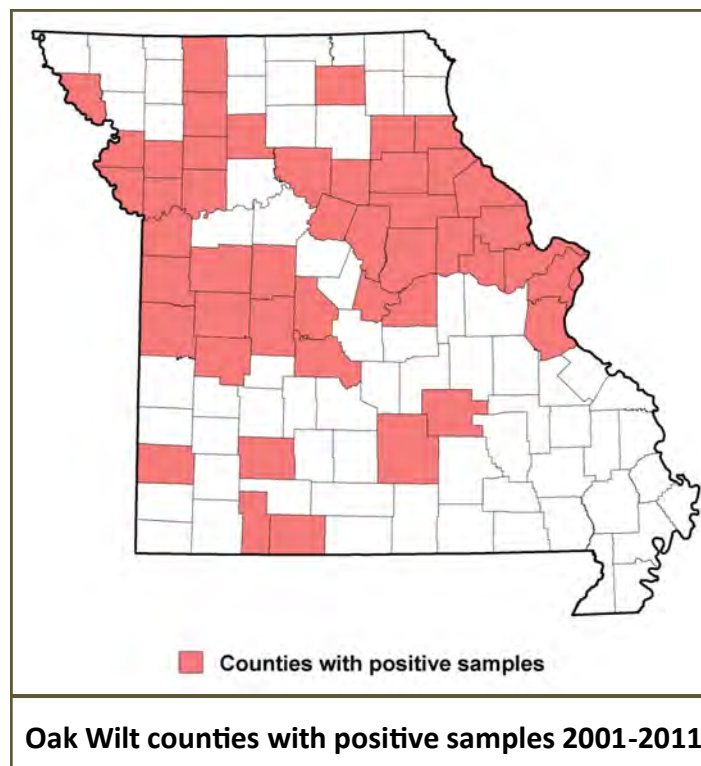
For information on other dogwood diseases see

<http://www.pubs.ext.vt.edu/450/450-611/450-611.html>

Oak Wilt

Oak wilt is an aggressive fungal disease affecting many oak species and causing oak mortality every year in Missouri. Symptoms vary by species; however species in the red oak group are more severely affected than species in the white oak group, with rapid leaf discoloration, wilting, and leaf drop. Since 2001, the MDC forest health lab has diagnosed oak wilt from 46 counties across the state. In 2011, positive black oak samples were submitted from two counties (St Charles and Warren). Some negative

samples were received after several weeks of high temperatures which may have impacted the results, as high temperatures can make disease confirmation difficult. Compared to recent years, fewer samples for oak wilt testing were received. It is possible foresters and arborists are feeling more confident in their abilities to diagnose this disease in the field or there may be concern about exposure of po-



tentially infected trees to high temperatures prior to sample submission this year. The USDA Forest Service guide to oak wilt has been recently updated and is available at:

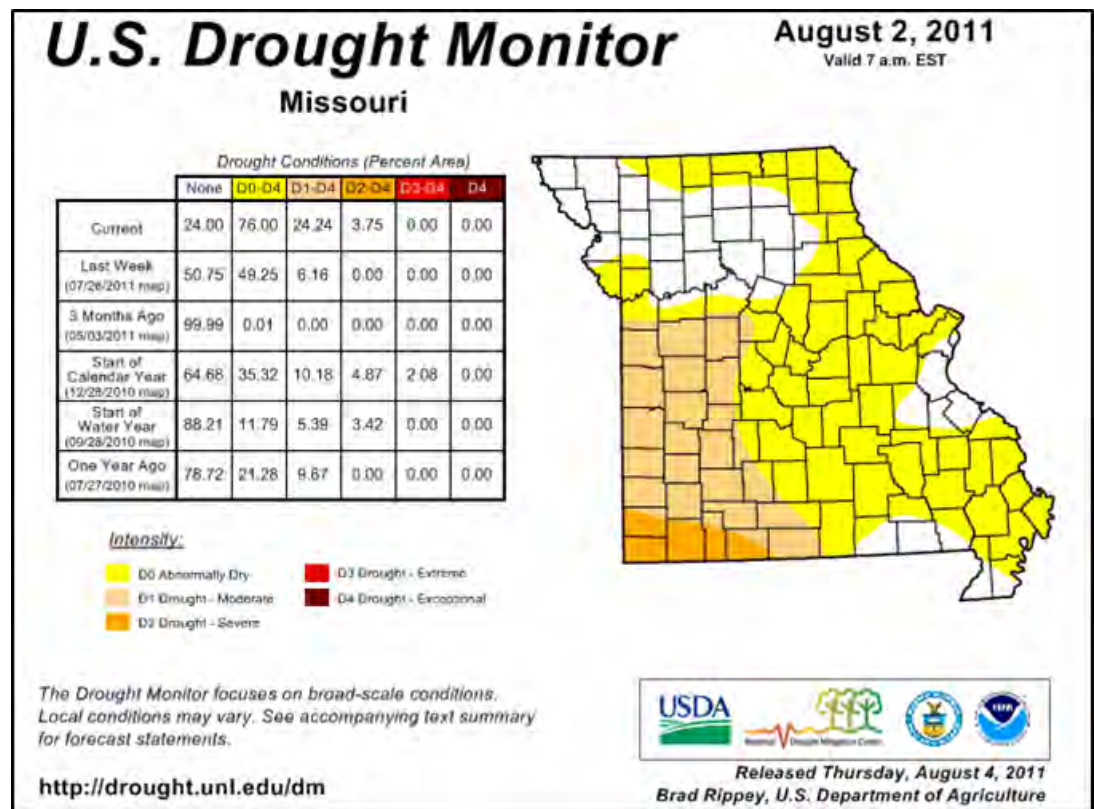
http://na.fs.fed.us/pubs/howtos/ht_oakwilt/identify_prevent_and_control_oak_wilt_print.pdf

Weather-Related Issues

Highly variable and extreme weather during the past several years continues to be a major source of stress impacting forest health in Missouri. Precipitation was above normal across the state in 2008 and 2009, making that the wettest two-year period on record. In 2010, except for southeast Missouri, rainfall was again above average for much of the state. This year, after a winter with record snowfall events, spring began with above normal precipitation. Many counties in southern Missouri had the wettest April on record, some counties receiving more than 20 inches for the month. Statewide, it was the 5th wettest April on record. However, the wet spring transitioned to very dry conditions, the hottest July in over 30 years and the 8th hottest month ever recorded for Missouri. Some trees subjected to abnormally wet conditions during the past few years may have developed shallow root systems over time, and soft lush growth this spring left them poorly adapted to the sudden onset of hot dry weather this summer.

Drought conditions were especially severe in southwestern Missouri where many reports of drought-scorched tree crowns were received. Many reports included trees on west or south facing slopes in Stone, Barry, McDonald and Newton counties.

Moisture fluctuations of the past few years are only a part of the tree stress brought about by the weather. A week-long freeze event in April 2007, following an unusually early spring warm-up and early tree development caused visible tree damage nearly state wide, but also caused more subtle damage that is still becoming apparent as some trees continue to decline. Damage from ice storms, wind storms and tornadoes in recent years has also caused tree damage that continues to become apparent. We anticipate damage from the weather this year and earlier events to continue to show up in the next few years through increased insect and disease damage and decline.



White Oak Decline and Mortality

Beginning in August and continuing into the fall, we received many reports of rapid white oak decline and mortality. Reports were received from across the state, however a majority came from central and northern Missouri. Most reports fit one of two patterns:

First, many affected trees are large, spreading, mature white oaks on upland sites often in lawns and other open areas. Rarely, clusters of up to 3-4 white oaks in natural forested areas, young white oaks, or other oak species have had similar

symptoms. Affected trees often show little evidence of decline prior to browning of large sections of the canopy in early August. Some trees rapidly advanced to browning and death of the entire canopy,

while in other cases trees still had some live branches at the end of the summer. Brown leaves appear to hang on the tree. Extensive Hypoxylon canker infection is frequently present as bark begins to fall from the trunk and large branches. Preliminary ex-

amination of some trees indicates some evidence of decay in the root flare but evidence is not present in many trees. Flat-headed borer larvae have been present in the lower trunk and root flare of some trees. Very few trees have had any evidence of *Armillaria* associated with the root flares or fruiting around the tree.

In the second observed pattern, decline and mortality occurs in pockets of white oak on lower slopes and bottomland in natural forested areas with good soils and adequate moisture. These trees also died in late summer, and flatheaded borer



White oak displaying symptoms of late summer mortality



Hypoxylon canker on an oak branch



Damage consistent with two-lined chestnut borer on white oak bole

larvae consistent with twolined chestnut borer have been found colonizing some trees.

In 2010 in many parts of the state, white oaks were stressed in late spring by leaf browning caused by jumping oak gall. Recent weather events have also caused tree stress. These white oak issues are being investigated by state Forest Health staff who hope to have additional information in the future.

Hypoxylon canker: <http://pods.dasnr.okstate.edu/docushare/dsweb/Get/Document-2312/EPP-7620web%20color.pdf>

Two-lined chestnut borer: <http://www.na.fs.fed.us/spfo/pubs/fidls/chestnutborer/chestnutborer.htm>

Conifer Problems

In late summer and fall, reports of conifer problems have continued for a variety of species, particularly spruce, pine and arborvitae. Trees were dropping needles and/or drying out and turning brown. Many of these non-native trees were stressed by site conditions, excessive spring moisture and drought this year. Multiple agents were detected including pine sawyer beetles, other insects and needle diseases.

Other issues including root diseases may be present but have not been detected from submitted samples. See the August issue of Missouri Forest Health Update for additional causes of conifer damage this year.

More information on summer 2011 impacts on evergreens: <http://ppp.missouri.edu/newsletters/meg/archives/v17n10/a2.pdf>

Pine sawyer beetles:

<http://www.entopl.okstate.edu/ddd/insects/pinesawyerbeetle.htm>



Late summer pine mortality